1/2008

livingmetals

EXCELLENCE IN POWDER METALLURGY

plansee GROUP

Solar cells: Powered by Molybdenum

Ceratizit: Growth in selected niche markets

PMG supplies P/M soft magnetic components

Molybdenum – when small amounts make a big difference

Dear reader,

Molybdenum, the 42nd element in the periodic table, is almost unknown to the general public. People don't realize that actually, they are constantly surrounded by this metal in their everyday lives – in fact, 9.3 milligrams of it are even found in the human body, where it plays an essential role in enzyme catalysis.

Molybdenum is a rare chemical element which has a very high melting point, and is able to withstand extreme temperatures without thermal expansion or softening. It also exhibits excellent corrosion resistance, weldability, and thermal and electrical conductivity. Because of these properties, it is used in a large range of everyday products, particularly in high-tech equipment.

Whenever you switch on an LCD flatscreen TV or a digital camera, a Molybdenum layer is activated. If your house has thin-film solar cells on the roof for generating electricity, Molybdenum will be used as an electrical back contact. And it's Molybdenum ribbons that enable metal halide lamps to deliver their high-intensity discharge, by ensuring gas-tight current feedthrough in the quartz glass.

Molybdenum is also found in hybrid vehicles, where it is used in the transistor power modules that control the electric motor. And it is increasingly used in the electronics industry, for example in heat-sink materials for rectifier diodes (used in consumer goods), and in high-power semiconductors (used in motor control and power generation). And if you ever have a mammogram, it is likely that the X-ray target in the scanner will be made of a Molybdenum-based alloy.

However, Molybdenum is not only found in everyday products, it is also used in the manufacture of other types of high-tech items. For example, it is often used as a high-performance component in glass production and plastic injection molding.

It may be true that the quantities of molybdenum found in both the human body and everyday electrical products is small compared to other elements, such as iron or copper. But it is also true that without it, both the human body and the technology we depend on would not perform nearly as well.

Wishing you an enjoyable read,

Dénes Széchényi
Editor of Living Metals

an essential
niche product

CONTENT

IMPRINT

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International Plansee Seminar in May 2009

Plansee Group has decided to host again the 17th International Plansee Seminar. The seminar will take place in Reutte, Austria from 25 to 30 May 2009. More than 500 power metallurgy experts from the fields of refractory and hard metals are expected to attend – with representatives from companies, research labs and universities giving a comprehensive insight into the latest developments for new materials, applications and technologies.

Registration for the presentations and poster sessions opens in March 2008 and will close in August 2008. Reservations for the all-inclusive tickets (comprising transport, hotel, catering and evening program) can be made from March 2008.

16th International Plansee Seminar in June 2005.

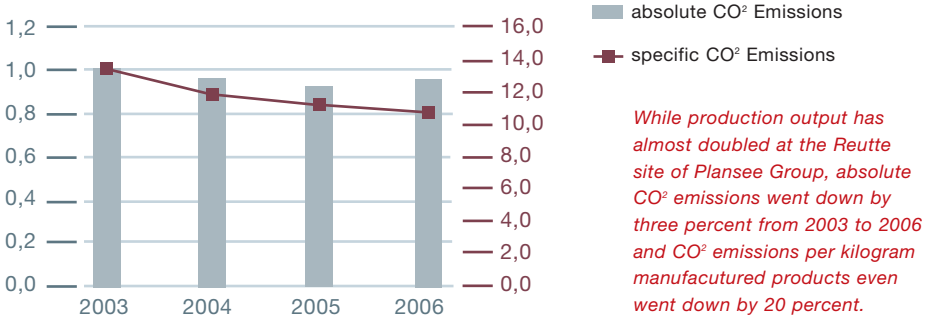
Environmental report published

The Plansee Group recently published the first-ever environmental report on activities at its largest production site in Reutte, Austria.

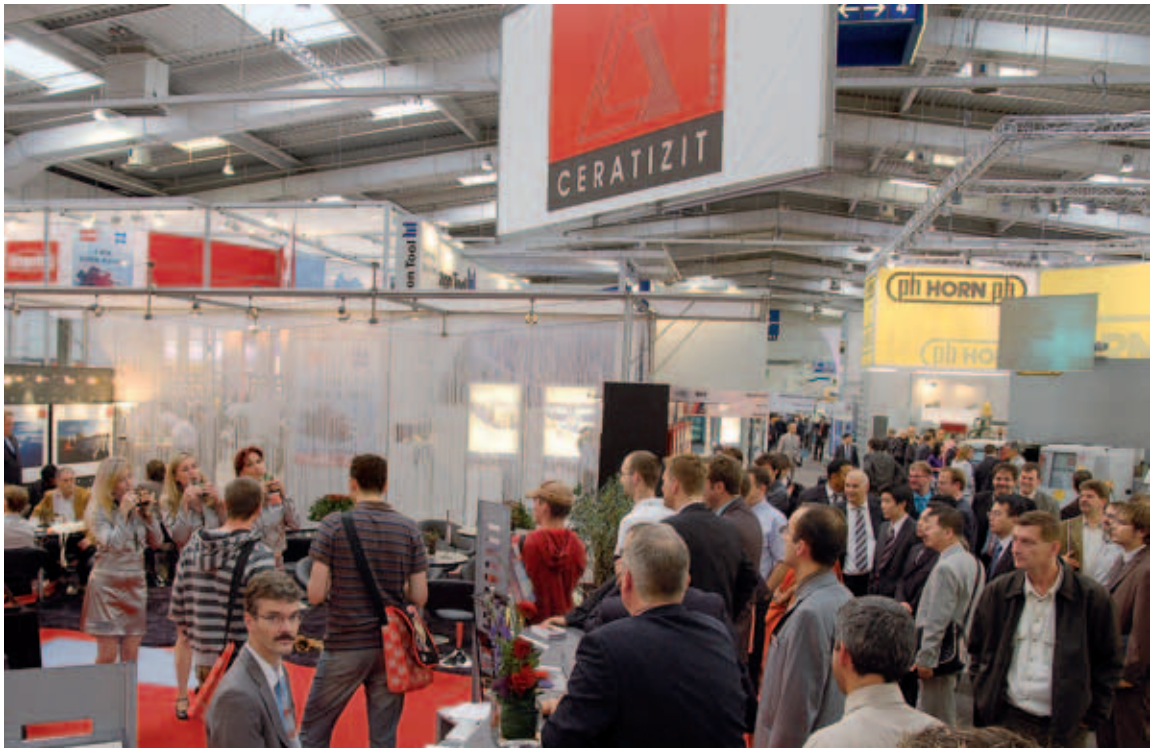
Key findings of this year's report show that, despite output almost doubling, absolute carbon dioxide emissions at the Reutte site decreased by three percent over the period 2003 to 2006, and carbon dioxide emissions per kilogram of products manufactured was reduced by a massive 20 percent.

The report provides key data on raw material usage, energy and water consumption, and emissions of greenhouse gases, molybdenum oxide, and industrial wastewater, as well as details of waste and environmental incidents. The fact that the company has defined environmental key performance indicators at the site demonstrates its commitment to reducing its environmental impact. The report will be published annually from now on, and can be downloaded at www.planseegroup/News soon.

CO^2 emissions



While production output has almost doubled at the Reutte site of Plansee Group, absolute CO^2 emissions went down by three percent from 2003 to 2006 and CO^2 emissions per kilogram manufacutured products even went down by 20 percent.



“Constantly increasing our market share”

Ceratizit board member Thierry Wolter used the EMO trade show in Hanover, Germany to reaffirm the hard metal manufacturer’s ambitious aims: sustainable, profitable growth and geographical expansion.

Ceratizit attracted large crowds at both its EMO booth and press conference.

“We are established worldwide, we are innovative and customer-focused, and we are constantly increasing our market share in the highly competitive tooling industry,” remarked Wolter. The company’s variety of distribution channels and its clear focus on selected niche areas have been the key drivers of its success.

“We only operate in areas where we can clearly outperform the competition,” Wolter explained. As such, Ceratizit focuses on selected niche markets where it establishes leading positions through offering complete packages, providing first-rate customer care, and by building long-term development partnerships.

Ceratizit supplies its markets via three different channels: end users are offered tailored products directly; small and medium-sized business are provided with standard tools via the WNT sales organization, and mid-sized tool manufacturers are supplied with hard metal blanks and finished cutting inserts.

At the EMO trade show Ceratizit exhibited a range of products for specific fields of application. These included tools for machining components, working aluminum and titanium components, as well as turbine blades, for the aircraft industry, tools for heavy-duty machining in machine construction, and tools for working engine block components, brake discs and aluminum wheels in the automotive industry.

Proven capabilities of R&D facilities

PMG is strengthening its activities in the US. Production capacities at its site in Indiana will be expanded and a new R&D lab will be built.

The Indiana site will be focused and the site takes over the manufacturing of some strategic products that were being produced at the Ohio site. The remaining Ohio business has been divested.

Building of a new R&D facility is also due to be completed in March 2008. Comments Michael Krehl, PMG board member: "Our R&D facilities in the US have time and time again proven our ability to bring new technologies to mass production and therefore guarantee a sustainable development of our Indiana site."

efficiency

Ceratizit: Centers of Excellence in the USA

Ceratizit strengthens its production and sales network in the USA. After the acquisition of Newcomer Products, Ceratizit USA's North American headquarters have been relocated to Latrobe, Pennsylvania.

The facilities' size at Latrobe, its geographic location, and domestic powder production and recycling operations achieves the strategic positioning needed to maintain a competitive position in the North American market.

Moreover Ceratizit USA will consolidate its US production facilities by closing the Columbia, South Carolina location and consolidating the operation into the Latrobe, Pennsylvania and Warren, Michigan facilities.

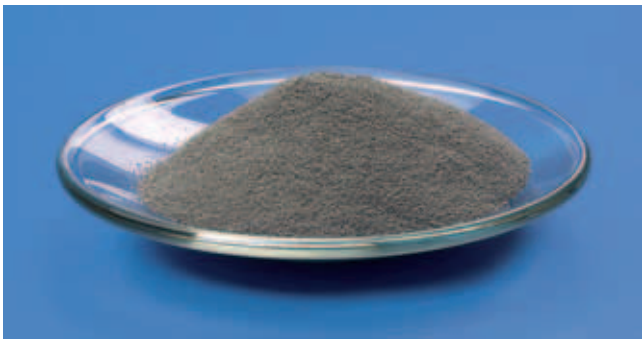
The North American distribution center will be centralized in Latrobe with regional support from Warren and global support from the global distribution center in Germany.

Ceratizit's US Headquarter: Relocated to Latrobe, Pennsylvania.

42 Mo

Molybdenum ore

Molybdenum dioxid



Molybdenum trioxid

Molybdenum

The unique properties of Molybdenum

Emerging markets and applications are seeing a shift in the reasons why industries employ Molybdenum, while these new uses account for a quarter of all the material that is consumed worldwide. Furthermore, there is huge growth potential, particularly in the fields of electronics and coatings.

These were the key conclusions of a presentation recently given by Plansee at the 18th Annual General Meeting of the International Molybdenum Association (IMOA) in Vienna, Austria, where the main applications of Molybdenum in a range of different industries were discussed.

Lighting: Molybdenum has traditionally been used in halogen and discharge lamps and as yet, no other material has been found that offers the same properties. In terms of new applications, Molybdenum is now used for cold cathode fluorescent lamps (CCFL) due to its thermal and electrical conductivity as well as its sputter resistance and emissivity. High brightness light emitting diodes (HBLED) also employ Molybdenum for its thermal and electrical properties.

Glassmaking and high-temperature furnaces: Molybdenum's strength at high temperatures, corrosion resistance, and compatibility with most glass compositions make it an ideal material for glassmaking, while it is also particularly cost-effective.

Molybdenum is used by the vacuum furnace industry in applications that require exceptional cleanliness and contamination-free operation, and super alloys and high-tech material systems are processed in all-Molybdenum furnaces. Furthermore, with the increasing interest in nuclear technology, there may also be an increase in demand for fuel sintering furnaces, which tend to use Molybdenum components.

Material forming: Traditional applications include isothermal forging, tube forming and molten zinc handling. Molybdenum is also increasingly being used in metal extrusion, plastic injection molding and aluminum and magnesium casting, and for manufacturing products such as MHC dies, Titanium-Zirconium-Molybdenum (TZM) hot runner nozzles and TZM tool inserts.

Increasing quality demands in automotive castings and casting design have meant traditional die materials are no longer suitable, and have led to greater use of TZM in critical parts of casting tools. Manufacturers of plastic injection-molded components are also turning to TZM tooling, despite the fact that their operating temperatures are generally much lower than traditional metalworking or metal casting processes. TZM is favored here due to its excellent strength, corrosion and erosion resistance, and its thermal stability.

Medical technology: Medical applications of Molybdenum are almost exclusively limited to components found in the high-energy

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hybrid vehicles

glass melting

plastic molding

Plansee delivers Molybdenum components for emerging markets and applications such as hybrid vehicles (IGBT power modules), glass melting (electrodes) and plastic molding (TZM hot runner die inserts).

applications

rotating anode tubes that are used in computerized axial tomography scanners. The rotating anodes use pressed, sintered, and forged TZM discs with a Wolfram-Rhenium focal track on it.

The designs are extremely sophisticated, and the higher power densities they require means that a lot is demanded from the materials involved, with the energy deposited by the electron beam requiring ever larger targets spinning at ever faster speeds. Weight restrictions driven by stress and balance considerations are also leading to reductions in Molybdenum mass in the targets.

Electronics: The electronics industry has incorporated Molybdenum for many years. Today, the material is used extensively as a heat sink material for rectifier diodes in consumer goods, and for high-power semiconductors used in motor control and power generation.

Mobile phone technology and hybrid vehicles are set to drive the use of the material in this area of application. Radio frequency integrated circuits for telecommunications are built on Molybdenum based substrates that have higher thermal expansion coefficients than silicon. These same materials have also recently been used in heat sinks for the integrated gate bipolar transistor (IGBT) power modules that are found in hybrid vehicles.

Coatings: A major application traditionally has been flame spraying to improve the wear and friction properties of automotive components such as gears, synchronizers, and piston rings. Recently-developed Molybdenum powders are now used more commonly in these areas, with plasma spray technology employed. These powders are often alloyed with nickel and chromium to produce highly corrosion-resistant coatings.

Sputtered Molybdenum coatings used in the production of solar cells and thin film flat panel displays are an emerging application of the material. This is due to Molybdenum's physical and chemical properties, rather than its high-temperature strength and creep resistance which have been behind most of its uses in the past.

Achieving success as Plansee brands

Former Elektro Metall AG and Schwarzkopf Technologies LLC have incorporated the Plansee brand into their company names.

In late December Schwarzkopf Technologies changed its name to Plansee USA. As the customer base of Plansee is becoming more and more global, the name change should contribute to further align the group's worldwide production, sales and marketing network.

Since October 2007 formerly Elektro-Metall AG operates as Plansee Powertech AG. The new name should support the company to expand into Asian markets where the brand name Plansee is already established as the world market leader for refractory metals and composite materials.

Plansee Powertech works closely alongside the world's leading energy technology firms and since 1999 has been named ABB's number one supplier. |

Increase production capacities

expansion

The Ceratizit Group has increased its production capacities in powder processing and cutting inserts. Their customers can now benefit from a wider product portfolio in cutting solutions and easy access to high-quality raw materials.

Ceratizit aims to meet the full demand for tungsten carbide at its own production sites, in order to ensure that quality is consistently high and that customers have constant supply of the raw material. Ceratizit's ambitious growth targets meant that an expansion of the process capacities at its powder processing plant, Ceratungsten, Luxembourg was needed – and a few weeks ago, a new reduction furnace was put into operation in a newly built production hall.

In a further step to help the company to provide its customers with tailor-made metal cutting solutions, the production line at the site in Reutte, Austria has also been expanded. The expansion aims to double production capacity, make the whole production team more flexible, and significantly reduce delivery times. "The expansion will enable us to achieve even greater success, offer tailor-made cutting solutions and meet the varying and short-term demands of our customers," says Ceratizit board member Thierry Wolter. |

solar

Molybdenum layer enables flow of solar current

The development of thin-layer solar cells has rapidly gained ground in recent years, with both established manufacturers and new companies forecasting a bright future for green power derived from solar energy. An interesting business for Plansee High Performance Materials, as solar cells of this type are equipped with an extremely thin layer of Molybdenum.

energy

The solar cell of the future is thin, highly efficient, can be produced at low cost and uses little raw material. Research institutes, plant constructors and manufacturers are currently working to develop such a product, and competition is fierce.

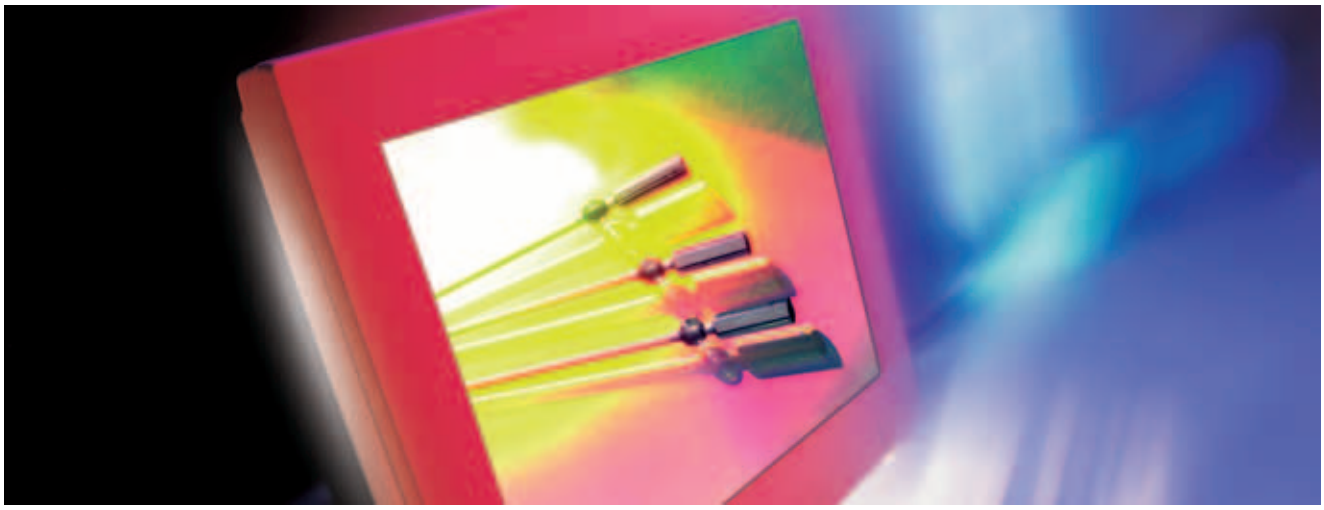
A thin-film solar cell is around 100 times thinner than a traditional silicon wafer-based solar cell, and has several functional layers whereby the bottom layer, the back contact, is made from pure Molybdenum.

Plansee High Performance Materials is currently mass producing sputtering targets – made from Molybdenum and Molybdenum alloys sheets and tubes. In the production of thin-layer solar cells, Molybdenum atoms are released from the sputtering targets and stored in evenly on the glass sheet. This creates a Molybdenum back contact, which closes the circuit, allowing solar current to flow.

The clear advantages of thin, anthracite-coloured cells include their significantly lower weight and their appearance – both of which are valued highly by structural engineers and architects.

Plansee High Performance Materials is developing solutions that enable sputtering targets to be used in the production process for as long as possible and that avoid production errors by using high-purity materials. It is also trying to eliminate complicated and time-consuming bonding processes and is researching a way to reuse expensive Molybdenum residues.

Currently, planar sputtering targets are still used for mass production, however pilot runs using rotatable sputtering targets are also being carried out. Plansee High Performance Materials has developed a new type of rotatable sputtering target that offers a number of benefits over hot isostatic pressed or plasma-sprayed competitor products – a deformed, fully dense rotatable target that has a significant higher wall thickness.



Top back-lighting performance

As brightness is a decisive argument for TV end consumers, Plansee has consequently developed the properties of electrodes for CCFL lamps which backlight all kind of LCD displays. Plansee High Performance Materials is now the only integrated manufacturer of ready-to-use CCFL electrodes.

CCFL electrodes of Plansee High Performance Materials increase the brightness of LCD TV screens while temperature and energy consumption are reduced and lifetime is extended. CCFL electrodes are an important component of CCFL lamps which backlight LCD TV screens and laptops.

Integrated manufacturing: From the molybdenum cups to the welded electrode.

Plansee is the only integrated manufacturer of CCFL electrodes producing the entire metal components from the raw material to the finished welded electrode assembly. The assembly of the electrodes including glass beading is done in cooperation with Blackburn MicroTech Solutions.

Powerful press

Plansee High Performance Materials has significantly increased its press capacities for flat products such as sputter targets. The newly installed cold isostatic press is designed to manufacture much bigger flat products in a shorter period of time. Cold isostatic pressing means that metal powder is filled into a rubber mold and compacted by applying uniform hydrostatic pressure onto this mold.

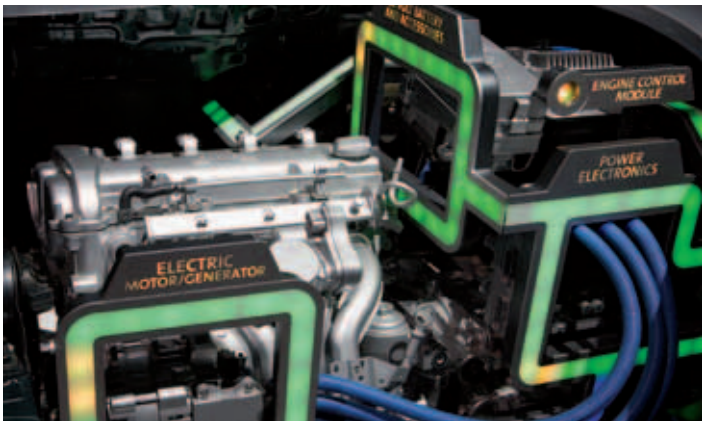
Improved soft magnetic technology

PMG has significantly improved standards of its P/M soft magnetic manufacturing process.

With its newly developed new P/M production process, PMG is able to supply soft magnetic cores with only half the iron-loss and up to 300 percent higher mechanical strength than conventional P/M solutions.

As well as increasing the efficiency of customers' magnetic or electric applications, one major added value offered by PMG's technology is a reduction in the size and weight of electric devices. The improved technology is used for example for a stator for diesel injection valves and a motor stator for industrial automation.

Soft magnetic components manufactured by powder metallurgy offer important advantages over magnetic cores made of lamination. Soft magnetic components are used in many different ways, including motors, generators, actuators, Diesel injectors, power tools, sensing devices, fuel pumps, fuel injectors, anti-lock brake systems, electrical power-steering systems, and much more. |



future

Working an intractable material

Titanium is known as an intractable material: it is difficult to machine efficiently. A new carbide grade from Ceratizit provides higher productivity combined with lower wear and higher cutting speeds.

The new grade is an extremely heat resistant carbide substrate with medium grain size. The new product marks as a prime example of the highly specialized niche markets Ceratizit operates in, and of the new solutions the hard metals specialist develops that add value for its customers. Ceratizit had drawn on all its expertise in cutting materials such as coating and geometry to develop the new grade named CTC5240.

The coating is adapted to titanium alloys and shows a clearly reduced tendency to chemical reactions like oxidation and diffusion with the work piece material. It is characterized by excellent tribological properties and high thermal stability combined with high hardness.

Additionally the coating acts as a highly efficient heat shield which protects the carbide substrate against early wear at high cutting speeds. The surface treatment leads to a very smooth rake face and considerably reduces the friction coefficient during machining.

CTC5240: This is the name of a new cutting solution for efficient titanium milling.

The new grades' geometry allows machining with very low cutting forces and pressures as well as good chip formation and efficient chip evacuation. |

Chances by challenges

Taking a closer look to recent developments, Plansee GmbH Lechbruck reveals to be in a good position for future growth. The completion of a new production hall and administration building combined with an additional new product scale is expected to be a winning concept. Plansee has concentrated all of its expertise in PVD hard coating at the site in Bavaria – where it plans to significantly expand the development, production and marketing of target materials for wear and decorative applications.

Further to the well-known and established "Lechbruck Products" this step towards PVD target business will definitely enrich the product portfolio of the site.

As a full-range supplier of hard coating targets, Plansee Lechbruck is heading for ambitious objectives:

- establishing development-partnerships with customers in the field of PVD targets for hard coating for wear and decoration applications
- expansion of the product range
- extension in production capacity

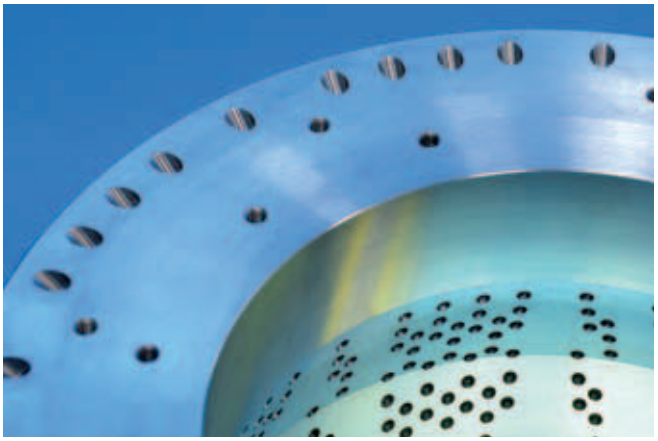
Continuing growth will be enforced by this new production line and will be furthermore enabled by the extension of the production area. Close cooperation with customers, internal and external partners, has led to technological leadership in refractory alloys.

"We're constantly facing new challenges and we are continuously adapting to changing global requirements," says Robert Riedl, Managing Director of Plansee Lechbruck, when explaining the development of the site since its foundation in 1975. Plansee Lechbruck has continually

solutions

developed new materials and adapted processes for finding access to new markets making a follow up industrial practice possible. "Our strength is flexibility and the experience in finding customized solutions. By thus customer requests are turned from ideas into products within an extremely short period of time."

This has been once again realized in Nuclear Medicine, setting a new standard in customer relationship: In closest collaboration a new collimator body for neurosurgery has been developed. The challenge was to find a way of combining the parts weight of a medium-sized car with the machining accuracy of a Swiss watch. Keeping the tightest tolerances is necessary to guarantee a successful treatment directing the gamma rays to a focus point of tenths of a millimeter to destroy a carcinoma. |



Performs with the same accuracy as a Swiss watch: collimator body for neurosurgery.

Easier to import

With the establishment of two trading companies, Ceratizit and Plansee can now import goods to China much more easily, making it more convenient for customers based there.

Ceratizit and Plansee have been present in Hong Kong for many years. But a growing number of customers want to be invoiced in Renminbi (RMB), the currency of the Republic of China.

Due to a change in law, customers can now buy goods from Ceratizit/Plansee without needing to use an import-export company – which makes the procedure much faster, cheaper and less bureaucratic. This prompted the Plansee Group to set up Ceratizit Langfang Trading Ltd. and Plansee Shanghai Commercial Ltd. in mainland China. Plansee Shanghai, managed by Richard Cheung, is a subsidiary of Hong Kong based Plansee China Ltd.

China

“Unique P/M expertise for the Chinese market”

“Quality is the basic requirement, costs are the major concern and flexibility is necessary” – says Richard Cheung, Managing Director of Plansee China about expectations of Chinese customers. In Living Metals he talks about tasks and challenges in the Chinese market.

interview

What do Chinese customers prefer – domestic or imported goods?
As always – it depends. Chinese customers are looking for the most suitable suppliers regardless of the country of origin. Imported goods will have longer lead-time, complicated custom clearance procedures, and handling costs. Although most of the imported goods are more expensive than domestic products, imported goods are used as quality and marketing argument for higher prices.

How is the Chinese refractory metals market developing?
The current technological and industrial developments in China are resulting in a significant increase in the demand for sophisticated refractory metal solutions. The Chinese refractory metals market is characterized by hundreds of small suppliers offering low-priced goods. However there is no doubt that Plansee is the leading refractory metals supplier, both in terms of our market share and the technology we provide. Our aim is to continue to strengthen this leading position in the years to come.

How does Plansee operate within this environment?
Plansee excels by both producing market-leading products and building close working relationships with customers. We provide efficient, stable technology that allows our customers to considerably lower their production costs.

As well as the high-quality products manufactured at our plants across Europe, in particular at our production site in Reutte/Austria, we are also excelling in customer relationship management in China. By working closely with our Chinese customers and understanding their real needs, we are able to leverage our extensive knowledge of refractory metals and materials application to help them achieve success.

Is it difficult to recruit and retain skilled employees with both technical expertise and cultural awareness?
Our ability to offer high-quality goods and services is becoming more and more important. To communicate our ideas to our customers in China we continuously invest in human resources and have formed a competent and dedicated team.

As well as high-profile engineers and strong business-minded individuals for our sales and marketing activities in China, we also need highly skilled employees who can meet the challenges of the Chinese market. However, in a rapidly growing country like China, the demand for such talent is high.

In this competitive environment, it is essential that the Plansee Group communicates its strengths and its unique positioning in powder metallurgy. Therefore we develop innovative ways to recruit new talent, and, in order to retain them, we offer our employees a stable job with a positive work-life balance.

FACTS & FIGURES

Plansee High Performance Materials (HPM) commenced sales activities in China in 1995. Plansee China currently has a main office in Hong Kong, along with three representative offices in Beijing, Shanghai and Guangzhou. Its customers primarily come from the lighting technology, electronics applications, power engineering and thin film technology industries. Plansee HPM China looks after Chinese business for both international companies and Chinese manufacturers.

Less is more

Balance weights for the automotive and aeronautics industries

Heavy objects do not necessarily need to take up a lot of space. And this is certainly the case with balance weights from Plansee High Performance Materials. These weights are used in the automotive industry as crankshaft balance weights for high-performance combustion engines and in a variety of other applications in high-end automobiles and racing cars. They are also used in the aerospace industry, in various rotating systems such as propellers, rudders and radars.

The balance weights are made from tungsten alloys, and are marketed under the Densimet and Inermet brand names. Each one weighs up to 20 kilograms. The near-net-shaped components are pressed and sintered in a P/M process, and, if necessary, finished to customer specifications. |

automotive

The VW Touareg: Equipped with tungsten alloy ballance weights from Plansee.

General Management Training

Complex change processes in a very competitive environment shape the entrepreneurial reality of the Plansee Group. Highly professional middle management executives play a vital role in differentiating, improving or even reinventing our business.

An International General Management Training is aimed at preparing middle managers of all three divisions of Plansee Group for management challenges well in advance. 18 participants are taking part in the first run that start at the end of January 2008 in Reutte. The program consists of 6 interlinked workshops with 25 seminar days supporting our newly established Plansee Group leadership principles.

The workshops will be held in Europe, the US and Japan. Objectives and contents are based on profound analysis and interviews with important Plansee Group stakeholders. The program architecture includes business impact projects and integrates senior managers as coaches. The framework of development is based on support, challenge and feedback and puts a strong focus on application. |

career

Welcome in the supervisory board

Since mid-December, Dr. Hariolf Kottmann has been a member of the Plansee Group supervisory board. Kottmann is a board member at SGL Carbon in Wiesbaden, Germany since 2001. SLG Carbon Group is the world's leading manufacturer of carbon-based products. Prior to this post, Kottmann worked for 16 years at the Hoechst Group. He has a PhD in chemistry. |

PLANSEE CERATIZIT PMG

Three divisions – one aim: Excellence in powder metallurgy

To address the highly specialized requirements of our customers in future industries, we have concentrated our material competence into three independent divisions: Plansee High Performance Materials, Ceratizit Hard materials & Tools and PMG PM-Products. In this way, we guarantee selective marketing, a targeted customer approach and individually-tailored product solutions.

As a private company, our thoughts and actions are focused on the long term, and our present investment is aimed at securing our leading position in powder metallurgy for the future. With the support of a unique corporate and innovation culture embracing our entire workforce, all our efforts are directed towards the achievement of one aim: **Excellence in powder metallurgy.**

Electronics

Lighting technology

Medical technology

Power engineering

Mechanical engineering

Automotive industry

Construction industry

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